## HARRY CRAWFORD FRANKENFIELD, 1862–1929

The Weather Bureau has just sustained a serious loss in the death of Harry Crawford Frankenfield on July 29, 1929. While crossing Madison Place, Washington, D. C., about 8 p. m., July 22, he was knocked down and severely injured by an automobile operated by a hit-and-run driver. Doctor Frankenfield was taken immediately to Emergency Hospital where he lingered until the 29th when the end came.

He was buried in Arlington National Cemetery with military and masonic honors.

Doctor Frankenfield was born at Easton, Pa., on November 24, 1862; was graduated from Lafayette College in 1881 with the A. B. degree and he received the A. M. degree in 1884. He also held the degree of M. D. from Howard University, of Washington, D. C.

Upon graduation from college he enlisted in the United States Signal Corps and after passing through the several courses at the School of Instruction of the Signal Service at Fort Whipple (now Fort Myer, Va.), he was detailed for duty at the central office of that service in Washington, D. C. Here he came under the notice and attention of Gen. A. W. Greely, then Chief Signal Officer.

General Greely, among all of the bureau chiefs of the Federal Weather Service (and the writer of this note has served under each of them), had his own particular way of becoming acquainted with the work of his subordinates. It was the general's custom to make almost daily a quiet informal inspection of the several branches and divisions of his office and he naturally soon came to know not only the name of each employee, but also the nature of the work he was performing and he had, moreover, an almost uncanny way of telling whether the work was being done to the best advantage. Young Frankenfield soon gained the general's approval and it is not therefore surprising that in 1887, without previous experience in charge of Signal Service stations, he should be selected for charge of the Chicago station, one of the most important stations of the Federal Weather Service.

He succeeded to charge of the St. Louis station in 1894 and was next detailed to duty in the central office of the Weather Bureau in Washington, in 1898, as a national forecaster.

Frankenfield brought to this position a mind of the most nimble sort; he was unusually quick to visualize the general ensemble of the weather charts from day to day and with experience soon became a successful forecaster. His contributions to the art will be found in Weather Forecasting in the United States and other papers.

The work in which his interest was greatest, however, was not weather forecasting but the prediction of floods in the main rivers of the country. The amount of labor devoted to this subject was prodigious; as a result his knowledge of the idiosyncrasies of the relations between rainfall and run-off in the rivers of the United States is not surpassed by any one. Many of his contributions in this field having but a local interest have not been published but are preserved in manuscript at the several Weather Bureau stations. His papers on the historic floods in the great rivers of the country may be found in the series of Weather Bureau bulletins, letter file, and also among the supplements to the MONTHLY WEATHER REVIEW.

Doctor Frankenfield was also the author of Weather Bureau Bulletin, F Kite Observations of 1898 and many shorter papers. For recreation he enjoyed a game of bridge and played a fair game of billiards, notwithstanding a very unorthodox style of stroking the cue ball. He was fond of walking and professional baseball games, but he eschewed golf and other forms of physical exercise.

He was a member of the Philosophical Society of Washington, the Washington Academy of Sciences, the Cosmos Club, and a fellow of the American Meteorological Society. He belonged to the Masonic fraternity having served as master of his lodge.

Doctor Frankenfield is survived by his wife Katherine Thornton Frankenfield and a sister Miss Flora Frankenfield. He will be remembered by his many friends within and without the Weather Bureau for his genial ways, his open, frank criticisms, and the loyalty to the friends he made and held. To the field men of the service he was without doubt the best known of the Washington office officials; to them and his many friends wherever found his untimely passing away will be a grievous loss.—*A. J. H.*

## NOTES, ABSTRACTS, AND REVIEWS

*Dr. J. Patterson becomes director of the Canadian Meteorological Service.*—The following letter will be of much interest to all readers of the REVIEW:

METEOROLOGICAL OFFICE,
*Toronto, July 11, 1929.*

DEAR PROFESSOR MARVIN: Sir Frederic Stupart retired from the position of director the 30th, June, and I have been appointed to succeed him. It shall ever be my desire to continue and develop the happy relationship that has always existed between the two services. I shall at all times be pleased to do anything in my power to advance our common interests.

Yours sincerely,

(Signed) J. PATTERSON.

Prof. C. F. MARVIN,
*Washington, D. C.*

The retiring director, Sir Frederic Stupart, entered the Canadian Meteorological Service in 1873, thus serving about 57 years. In 1894 he was made director. In 1916 he was knighted. Since Doctor Patterson has been associated with Sir Frederic for a great many years it is gratifying to know that the same cordial relations that have always existed between the meteorological services of the two countries will continue.—*Ed.*

*R. De C. Ward's proposed guidebook to the world's weather and climates.*—Prof. Robert De C. Ward, of Harvard University, in an address before the American Philosophical Society in April, 1928, suggested that the compilation of a guidebook to the weather and climates of the world would serve an extremely useful and educational purpose. "A complete guidebook," said Professor Ward, "should include three aspects of the general subject with which it deals. It should give descriptions of characteristic weather types, as, e. g., a typical day in the heart of the trade-wind belt at sea; a winter spell of bright, sunny weather in the Alps; a cold wave in the eastern United States; a summer rainy spell on the highlands of Scotland, and so on. It should next give simple but scientifically accurate descriptions of special local meteorological phenomena, such as the winter monsoon on the west coast of Japan; the 'cloud drip' on the island of Ascension; the typhoons of the eastern seas. Thirdly, it should give vivid descriptive accounts of the various climates to be met with in different parts of the world and their economic and general human relations, as, for example, the damp marine coast climate of Alaska, with its dense vegetation, its glaciers, and its unsuitability for agriculture; the desert climate of the 'dead heart' of Australia, a great barren waste, without hope of any general reclamation or development; the modified tropical climate of the plateau of East Africa, with its possibilities for future white settlement; the continental climate of central Europe, neither as extreme as that of the northern interior of North America on the one hand nor as mild and even tempered as that of the British Isles on the other."—*A. J. H.* 629.132.1 (961.3)

*Pilot-balloon observations at Apia, Samoa.*—Mr. Andrew Thomson, director of Apia Observatory, has recently published the results of 380 pilot-balloon observations made at Apia, western Samoa (lat. 13° 48.4′ S.; long. 171° 46.5′ W.), during the period between May, 1923, and April, 1928.[1] An excellent feature of the pamphlet is the numerous graphs depicting various phases of the aerological data. Especially interesting among these are Figure 3, showing the variation of wind velocity with height and the number observations at different heights; Figure 5, showing the percentage frequency of wind direction at various levels; Figures 9 and 10, showing average altitude of boundary between winds with east-west and north-south components, respectively, and Figure 11, showing the constancy of wind direction at various levels.

In connection with the change of wind direction with height the author states:

At the surface and up to a level of 0.25 kilometers the observed winds are from nearly true east all the year round. * * * At heights from 2 to 3 kilometers westerly winds become increasingly frequent, and at 8 kilometers, they are more common than easterly winds. Above this and up to at least 14 kilometers blows a strong steady wind from approximately southwest. From March to October this wind persists to an altitude of 20 kilometers.

Regarding the velocity and constancy of upper winds he states:

The trade winds would appear to have their maximum velocity of 6.1 m.p.s. at about 0.25 kilometers altitude, decreasing continuously above this level. In the layer of westerly winds or counter trades the maximum velocity of 10.8 m.p.s. is reached at 11.5 kilometers. G. M. B. Dobson has shown that in England the tropopause is characterized by high and rapidly varying wind velocities. It is probable that the tropopause in the latitude of Apia is at least 14 kilometers high so that the maximum velocity here found for this station is not associated with the tropopause.

In view of the fact that the average wind velocities continue to increase with height aobve 14 kilometers and also that a month's series of sounding balloon observations made at Groesbeck, Tex. (lat. 31° 30′ N.; long. 96° 28′ W.), in October, 1927,[2] showed the mean height of the stratosphere to be 14.8 kilometers it is thought that its average height over Apia is appreciably greater, probably close to 17 kilometers.[3]

Regarding the steadiness of the winds the author states:

For the whole year the winds from the surface to 3 kilometers are steady in direction. The greatest variability occurs at 4.5 kilometers but above 6 kilometers a fairly constant direction is again maintained. This is notably the case for the stratum lying between 10 and 12 kilometers. * * * The counter trades are almost as constant at the levels where they have the greatest velocity as are the trade winds blowing at the surface.

In discussing the mass movement of air which the author represents by the product of the mean velocity and the density of the stratum, he states,

In the layers below 14 kilometers there is 5.3 times as much air transported toward the Equator during the year as moves polewards. Every month shows this excess of northward moving air. It can scarcely be counterbalanced by currents above 14 kilometers flowing away from the Equator, since the inclusion of all available data to 20 kilometers would increase the excess. The density of air at 20 kilometers altitude is only 3 per cent of that at the surface. Since the fraction of the atmosphere above 20 kilometers which is unaccounted for is so small it must be concluded that Apia is a point where there is a great inflow of polar air toward the Equator. * * * It is probable there is almost equality in the masses of air moving eastward and westward above Apia.

It is hoped that a larger objective may be substituted for the one which was used on the theodolite in view of the author's statement that higher observations would be possible if that were done. Based on experience with the theodolites used by the Weather Bureau it is thought that heights above 20 kilometers would be comparatively frequent under the conditions of light winds prevailing in that region. It also appears probable that "free-rising" captive balloon observations would be very successful at Apia.—*L. T. Samuels.*

*Hailstorm at Duluth, Minn., June 10, 1929.*—Thunder heard at 2 p. m. and from 3 p. m. to about 4:10 p. m. Rain from 3:40 p. m. to 4:10 p. m. From 2 p. m. to 6 p. m. the barometer fell at steady rate of about 0.10 inch in four hours, no surging effect indicated by barograph. Clouds prior to storm were the usual thunderhead type. Wind force varied from moderate to fresh before, during, and after the storm—from southwest to 3:45 p. m., west to 3:56 p. m., northwest to 4:06 p. m., then west. Maximum velocity was 23 miles from northwest in the five minutes beginning 4 p. m. Very sultry conditions had prevailed all day, as well as during and immediately following the storm; this was the only outstanding or noticeable weather feature.

Hail from 3:56 p. m. to 4:07 p. m. Ground fairly carpeted with hailstones varying from marble size to as large and larger than baseballs, the larger ones being mostly round and averaging the latter size. (The standard baseball is understood to weigh 5 ounces.) The big hailstones fell between 4:05 p. m. and 4:07 p. m. The largest found at the Weather Bureau immediately after the storm measured 3 by 3 by 4¾ inches and weighed 6 ounces. Some of the irregularly shaped hail were reported as being even larger. One measured by an official of the American Paint Co. at Superior Street and Thirtieth Avenue West was stated as being 3 by 4 by 5 inches and weighing 12 ounces, and there were unauthenticated reports of still larger ones. The water content of the larger hail probably averaged around 0.02 inch. There was also some difference in weight of hail averaging the same size. Many were beautifully marked with the concentric layers.

Forty minutes after the storm a hailstone was found at the Weather Bureau measuring 2½ by 3 by 4½ inches weighing 5 ounces; and two hours after falling several were found averaging ½ by 1 by 1¾ inches and weighing around 1 ounce. The Weather Bureau lawn and flower beds are spotted with innumerable holes where the large hail fell, the holes being as deep and in some instances deeper than the measured diameter of the hail. This condition was rather general in the area affected.

As near as can be ascertained the larger hail fell over an area extending from about Fortieth Avenue East to Thirty-fifth Avenue West and northwest to including Duluth Heights, a suburb, representing a section approximately 7 miles long by 2 miles wide.

Much damage resulted, especially to store windows facing northwest, street lights, auto windows and windshields, skylights, and greenhouses. The glass damage alone will probably run about $20,000. Pelting hail stones penetrated the tops of hundreds of automobiles,

[1] Observations of Upper Currents at Apia, western Samoa (2d series), by Andrew Thomson, director of Apia Observatory. 1929.
[2] Published in this REVIEW, pp.—
[3] Nature (London), June 1, 1929, pp. 834-835, by K. R. Ramanathan.